

Various types of problems are faced by the business organisation. The problems may be: how many quantities of products should be produced? how many quantities of the products should be marketed? whether the new products should be introduced? how many quantities of raw materials should be kept in stock?

These types of problems will be solved by making the correct decisions about the right choice of the various options available to decision maker. So, the main function of the executive of the business organisation is to make well decision by choosing right strategy or alternative or option among the different options available to him. The successfulness of the business depends upon the good decision about the right option. On the contrary, the wrong decision made by the executive results the business totally failure. Thus the decision making is the process of selecting best alternative from the various alternatives available.

Steps in decision making

The following are the three major steps to be used in decision making.

- (1) Listing of all possible alternatives/strategy/options/actions.
- (2) Identification of future events/state of nature.
- (3) Construction of Pay-off tables/loss tables

Decision making in business environment

A decision maker takes decision under three situation or environments. In each of these situations, informations about the state of nature differ. The three environments under which a decision is taken, are

(1) Decision Making under condition of certainty

Under this situation, there exists only one of the state of nature. So, the decision maker definitely knows what the future state of nature will be when a particular decision is taken. Under condition of certainty, it is easy to analyse the environment and make good decision. Since this environment contains only one state of nature, so the decision maker analyzes the pay-offs of the available state of nature, picks up the highest pay-off and selects the alternative associated with the highest pay-off.

(2) Decision Making under condition of uncertainty

In this situation, there exists more than one state of nature. So, the decision maker does not know what the future state of nature will be when a particular decision be made. It is only in terms of probability that the decision maker can talk. Thus the decision making under uncertainty always involves a chance or probability. When the probabilities associated with the state of nature are not known, decision making under such condition is uncertain.

In such situation, the decision is based on the experience and the judgement of the decision maker with respect to certain decision criteria. There are four such criterias:

(a) Maximax Criterion

This is an optimistic decision making criteria. Under this criteria, the decision maker believes that the state of nature or event will always be advantageous for him.

steps: (i) select maximum pay offs from each alternatives.

(ii) then select maximum among the maximum pay offs.

(b) Maximin Criterion

This is a pessimistic decision making criteria. Under this criteria, the decision maker believes that the state of nature will be disadvantageous for him.

steps: (i) select minimum pay offs from each alternatives.

(ii) then select maximum among the minimum pay offs.

(c) Minimax Regret Criterion

In this criterion, the decision maker chooses a decision alternative which will minimise the loss or the regret. For using this criteria, conditional pay off table must be converted into regret table.

steps: (i) Regret values are obtained by subtracting each pay offs from the largest pay off in its event. Get such regrets for each events.

(ii) select maximum regrets from each alternatives.

(iii) then select minimum among the maximum regrets.

(d) Criterion of Realism (Hurwicz Criterion)

This criterion for decision making under condition of uncertainty is the compromise between maximax and maximin criterion i.e. between optimistic & pessimistic.

In this criterion, a coefficient of optimistic denoted by α ranges from 0 to 1, then $1-\alpha$ is the coefficient of pessimistic. When $\alpha = 1$, the criterion is optimistic and when $\alpha = 0$, it is pessimistic.

The value of α chosen depends upon the decision maker's judgement and the analysis of the state of nature.

steps: (i) Mark maximum and minimum pay offs for each decision alternative.

(ii) select appropriate value of α , the coefficient of optimistic.

(iii) Use the formula:

Measure of Realism = α (max pay off) + $(1-\alpha)$ (min pay-off) for each Alternative

(iv) Mark the maximum of the measure of realism. And get the decision alternative that gives the maximum measure of Realism.

(3) Decision making under the condition of Risk (EMV Criterion)

In this situation, there are more than one state of nature but the decision maker has sufficient information about the probabilities of the various states of nature. The assignment of probabilities to various states of nature can be obtained from the historical data taken from the records that are already available or from the experience and skill of a decision maker. This criterion for making decision under the condition of risk is known as "Expected Monetary Value" i.e. EMV. (through Pay off table).

The following are the steps to be adopted in using EMV Criterion.

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- computation of Conditional Profit for stock-demand combination
- (i) when stock = demand (Diagonal case) where
Profit = stock/demand units \times MP MP = Marginal Profit
= SPPU - CPU
= SPPU - CPU
- (ii) when stock < demand (Upper triangle case) ML = Marginal Loss
= CPU - salvage value
Profit = stock units \times MP
- (iii) when stock > demand (Lower triangle case)
Profit = demand units \times MP - unsold units \times ML
- (15)

This is another criterion through which decision may be taken. This criterion gives the same conclusion as on EMV criterion. This criterion minimizes the expected opportunity loss. The following steps are to be used in adopting the EOL criterion:

- ### Alternative way of computing Conditional losses for stock-demand combination

- (1) When stock = demand (Diagonal case), No loss occurs
loss = zero
- (2) When stock < demand (Upper triangle case), Opportunity loss occurs.
opportunity loss = (demand - stock) \times MP
- (3) When stock > demand (Lower triangle case), Obsolescence loss occurs.
obsolescence loss = (stock - demand) \times ML

Expected Profit with Perfect Information (EPPI) or Pay off under Certainty

If decision maker obtains some additional complete and accurate information about the future event, then he would remove all the uncertainty present in the problem. The additional information about the future event is termed as "Perfect Information". Under this circumstance, the decision maker would stock today the exact no. of outputs that the customers will demand tomorrow. In such a situation, the decision maker will be saved from the loss of unsold outputs. If he has a perfect information about the future events, he can make profit more than the highest expected profit from EMV criterion.

Thus the maximum profit which the decision maker can make by removing all uncertainties present in the problem is known as "Expected Profit with Perfect Information" or "Pay off under Certainty".

Expected Value of Perfect Information (EVPI) or Cost of Uncertainty

Suppose the manufacturer is getting a maximum profit of X if he could get the perfect information about the happening of the future demand. If he fails to get the perfect information about the future demand i.e., he could not remove the uncertainty, and then best possible expected profit he can make is Y (i.e. highest expected profit from EMV criterion). The difference $X - Y$ is known as "Expected value of Perfect Information". Hence the difference between the expected profit under Perfect information and the highest expected profit from EMV criterion is called "the expected value of Perfect information" or "cost of uncertainty".

$$\boxed{EVPI = \text{cost of uncertainty} = EMV \text{ under certainty} - EMV \text{ under condition of Risk}}$$

EVPI is the maximum amount that the decision maker is willing to pay to the perfect predictor to have the perfect information. The perfect predictor is the person from which the additional information can be obtained.

$$\boxed{EVPI = \text{Minimum expected loss under EOL criterion}}$$

Marginal Analysis :

In order to avoid the problem of excessive computation work that we did in EMV and EOL criterions, there is other method of getting an optimal stock decision known as the Marginal Analysis.

Marginal Analysis is based on the basis that when an additional unit of an item is bought, it may either be sold or not sold. If this additional unit is sold, there is increase in the conditional profit as a result of profit from the additional unit. This profit is known as marginal profit (MP). $[MP = SP - CP]$.

If the additional unit is not sold, this will cause a decrease in the conditional profit due to the unsold of this additional unit. The